

AbstractID: 8164 Title: Viewing angle performance of two liquid crystal displays for medical images

Purpose: Liquid crystal displays (LCDs) have a number of advantages over cathode ray tubes and conventional viewers based on film. However, it is known that the performance of LCDs varies by viewing angle. The purpose of this study was to compare the angular performance and effects on observer performance in different types of LCDs, namely a general purpose LCD for personal computers and one especially designed for medical use.

Materials and Method: Two types of LCDs were used in this study, an in-plane switching (IPS) technology display especially designed for medical use and a general-purpose twisted nematic (TN) technology display. We measured the luminance responses and contrast ratios for the two types of LCDs at different viewing angles (-60 degrees to 60 degrees). Furthermore, observer performance at various viewing angles in the horizontal direction for the medical display was also examined by eight observers based on contrast-detail diagrams.

Results: The two types of LCDs showed notable variations in luminance and contrast ratios as a function of the viewing angle. Results obtained in different directions (horizontal, vertical and diagonal directions) indicated different contrast ratios. Acceptable viewing angles in terms of the contrast ratio were much smaller in each direction than those for nominal viewing angles in the specifications provided by the manufacturers. Acceptable viewing angles of the medical-grade display in the horizontal and vertical directions were broader than those of the general purpose display. There was no significant difference in observer performance between 0 and 40 degrees. On the other hand, our results showed a statistically significant difference in observer performance between 0 and 60 degrees.

Conclusion: Contrast ratio and luminance response showed notable variations with different viewing angles and different types of LCD. More importantly, the detection of contrast-detail materials of the LCD monitor was influenced by viewing angles.